

REMARKS

Reconsideration of this application in view of the foregoing Amendment and the following Remarks, in conjunction with the accompanying RCE, is respectfully requested.

35 U.S.C. 112, First and Second Paragraph Rejections: Claims 2-3

The Examiner has rejected claims 2 and 3 under 35 U.S.C. 112, first paragraph, allegedly as failing to comply with the written description requirement. The Examiner alleges that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the specification was filed, had possession of the claimed invention. The Examiner alleges that the new matter includes “equal to a distance”. The Examiner maintains that although the applicants argued that one of ordinary skill in the art would interpret the phrase “a thickness with which said black matrix layer/overlapped edge portion protrudes from a surface...” as meaning a thickness “equal to a distance” which said layer/portion protrudes from a surface..” as meaning a thickness “equal to a distance” which said layer/ portion protrudes from a surface, but the Examiner maintains that the term “equal to a distance” is new matter not disclosed in the specification.

The Examiner has rejected claims 2 and 3 under 35 U.S.C. 112, second paragraph, allegedly as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as the invention. The Examiner asserts that the claimed limitation “a black matrix layer is formed below the underlying layer to a thickness equal to a distance which the black matrix layer protrudes from a surface of the color filter corresponding to the pixel electrode” is not clearly defined due to the lack of the definition of the indicated

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“distance”.

In response, with respect to both claims 2 and 3, the applicants have amended the phrase “equal to a distance” to read --equal to a thickness--.

To improve grammatical form, the applicants have also amended the limitation of “an underlying layer of said pixel electrodes *extend* such that an apex portion...” to read -- an underlying layer of said pixel electrodes *extends* such that an apex portion...—

Support for the amendment to claims 2 and 3 is found in FIG. 2A which discloses with respect to claim 2 an underlying layer (overcoat 11) of said pixel electrodes 3 extends such that an apex portion of said protrusions 13 protrude from said surface of said pixel electrodes 3 toward the side of said common electrode 4 and a black matrix layer 7 ~~is formed~~ below said underlying layer (overcoat 11) at a thickness equal to a thickness with which said black matrix layer 7 protrudes from a surface of said color filter 6B, 6R, 6G corresponding to said pixel electrode 3. The applicants have deleted the limitation of “is formed” in claim 2.

Support for amendment to claim 3 is also found in FIG. 2A which discloses an underlying layer (overcoat 11) of said pixel electrodes 3 extends such that an apex portion of said protrusions (slope surfaces 13) protrude from said surfaces of said pixel electrodes 3 toward the side of said common electrode 4 and, below said underlying layer (overcoat 11), edge portions of adjacent ones of said color filters 6B, 6R, 6G, are overlapped such that said overlapped edge portions have a thickness equal to a thickness with which said overlapped edge portion protrudes from a surface of said color filters 6B, 6R, 6G.

The applicants have also amended claims 2 and 3 to add the limitation of --a thickness of said liquid crystal layer between said pixel electrode and said common electrodes being substantially the same such that a first gap at edge portions of said pixel electrode becomes substantially the same as a second gap at the center portion thereof--

The foregoing limitation appears in cancelled claim 1 and is supported by the disclosure in the specification with respect to FIG. 7A, as found on page 16, lines 21-26, which discloses that the pixel electrode 3 is not overlapped with the slope portions 13 as shown in FIG. 7A. More preferably, a gap d_1 at the edge portions of the pixel electrode 3 becomes substantially the same as the gap d_0 , at the center portion thereof as shown in FIG. 7B.

The applicants have also amended claims 2 and 3 to replace the phrase “active elements” with --thin film transistors--. Support for the substitution of --thin film transistors-- with “active elements” is provided by page 2, lines 3-7, which disclose the following:

“As a drive system of the color liquid crystal display, there is an active matrix drive type color liquid crystal display having a switching element such as silicon TFT provided for each of a number of display pixels for controlling a write operation of signal voltage.”

In addition, support for the substitution is provided by cancelled claims 6 and 7.

To improve grammatical form, the applicants have also amended the phrase in claims 2 and 3 of “orientation of liquid crystal molecules of said liquid crystal layer is divided *to* a plurality of orientations by said slopes” to read -- orientation of liquid crystal molecules of said

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liquid crystal layer is divided into a plurality of orientations by said slopes--.

As a result, no new matter has been added by any of the amendments to claims 2 and 3.

Prior to addressing the rejections over the prior art, the applicants call to the Examiner's attention that the applicants have cancelled claims 1, 5-7, 11-12 and 14-15 without prejudice. The applicants have not abandoned the subject matter of claims 1, 5-7, 11-12 or 14-15 and reserve the right to reinstate or to file a continuation application directed thereto.

The applicants have also changed the dependency of claims 4, 8-10 and 13 from cancelled claim 1 to independent claim 2. No new matter has been added by any of the amendments to claims 4, 8-10 and 13.

35 U.S.C. 103(a) Rejections: Claims 1-15

Claims 1 and 6-8

The Examiner has rejected claims 1 and 6-8 under 35 U.S.C. 103(a) as being unpatentable over Kume et al (US 6,115,098 - filed December 23, 1998 - issued September 5, 2000) in view of Yamada et al (US 6,327,016 B1 - filed September 28, 1999 - issued December 4, 2001).

The Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt the structure as disclosed by Yamada to the device of Kume to improve the transmittance, the response speed and the stability of alignment of the liquid crystal molecules.

The applicants direct the Examiner's attention to the fact that, as noted previously, the applicants that claims 1 and 6-7 have been cancelled without prejudice. The dependency of claim 8 has been changed from cancelled claim 1 to claim 2. The applicants maintain that claim 8 patentably distinguishes over Kume et al in view of Yamada et al in view of the arguments which follow regarding claim 2. Consequently, the applicants respectfully request that the Examiner withdraw the rejection of claim 8.

Claims 2-3

The Examiner has rejected claims 2-3 under 35 U.S.C. 103(a) as being unpatentable over Kume in view of Yamada, as applied to claims 6-8 above and further in view of Kishimoto (US 6,437,847 B1 - filed August 15, 2000 - issued August 20, 2002).

First, the applicants wish to call to the Examiner's attention that both claim 2 and claim 3 are independent claims and do not depend on claims 6-8. As a result, the applicants assume that the Examiner intended to present in part the same assertions rejecting claims 2 and 3 as were presented regarding claim 1. That is, the Examiner concedes that Kume et al do not disclose that "*a thickness of said liquid crystal layer between said pixel electrode and said common electrodes being substantially the same such that a first gap at edge portions of said pixel electrode becomes substantially the same as a second gap at the center portion thereof*". However, the Examiner maintains that Yamada discloses the prior art for a liquid crystal device that the thickness of the liquid crystal layers is substantially the same at the edge portions and the center portion (FIG. 3, marked as h_p .) (The applicants note that in fact, FIG. 3 pertains to the invention of Yamada et al).

The Examiner asserts that Kume et al and Yamada et al disclose all of the limitations of claims 2-3 except the thickness of the black matrix layer. The Examiner asserts that however, Kishimoto, column 6, lines 41-62, discloses the thickness of the black matrix and its relationship to the surface of the color filter. The Examiner concludes that therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt the structure disclosed by Kishimoto to the structure of Kume and Yamada to provide a display having improved display quality and wide viewing angle characteristics; capable of preventing unevenness of cell gap within the display region and reducing problems caused by such uneven cell gap such as uneven brightness, color and viewing angle characteristic.

In response, with respect to claim 2, as amended, the applicant maintains that in Kume et al, FIG. 4A, the signal electrode 3 overlaps with the sloped portions of the liquid crystal region 8, and therefore, the thickness of the liquid crystal layer is changed between the opposing signal electrodes 3 and 4. In such a structure, the thickness of the liquid crystal layer at the pixel region is not uniform with the result that there is a deterioration in the optical characteristics of the display.

Yamada et al relates to a plasma addressed liquid crystal display device according to column 8, lines 26-29, which discloses with respect to FIG. 4A that components necessary for driving the plasma addressed liquid crystal display device 200 may be the same as those used in conventional plasma addressed liquid crystal display devices. Since those skilled in the art recognize that a plasma addressed device does not require thin film transistors (TFT), Yamada does not teach a color filter on a TFT (COT) structure suitable for widening a viewing angle of a

pixel display.

In addition, FIG. 3, referred to by the Examiner, and column 6, lines 18-33, disclose only first and second substrates 10 and 20 and a protrusion-like structure 11 having a height h_p provided on the first substrate 10. The liquid crystal layer 40 is interposed between the first and second substrates 10 and 20. The LCD layer 40 is divided by the protrusion-like structure 11 into a plurality of liquid crystal regions 60 including subregions 60a (subpixel regions).

Therefore, Yamada does not disclose, teach or suggest a pixel electrode substrate including pixel electrodes, thin film transistors, color filters and a first alignment layer covering said pixel electrodes, said thin film transistors and said color filters, as recited by claims 2 and 3.

With respect to Kishimoto, the applicants maintain that the transparent electrode 15 shown in FIG. 1 is overlapped with the slope portions, and thus the thickness of the liquid crystal layer is changed between the opposing electrodes 15 and 25. In such a structure, the thickness of the liquid crystal layer 30 at the pixel region is not uniform and therefore, deterioration of the optical characteristic of the display occurs.

In contrast, in the present invention recited by claims 2 and 3, a thickness of said liquid crystal layer between said pixel electrode and said common electrodes being **substantially the same** such that a first gap at edge portions of said pixel electrode becomes substantially the same as a second gap at the center portion thereof, that is, the thickness of the liquid crystal layer at the pixel region is kept uniform so that improved optical characteristics are obtained over the prior

art of Kume et al.

As a result, one of ordinary skill in the art at the time the invention was made would not have been motivated to combine the teachings of Kume et al with those of a plasma addressed display of Yamada et al and Kishimoto to yield the present invention of claims 2 and 3. Even if one of ordinary skill in the art were somehow motivated to combine the teachings of Kume et al with those of Yamada et al and Kishimoto, the hypothetical device resulting from such a combination would not yield the advantages of the present invention of claims 2 and 3 wherein the thickness of the liquid crystal layer at the pixel region is kept uniform to achieve good optical characteristics.

Consequently, claims 2 and 3 patentably distinguish over the prior art. Therefore, the applicants respectfully request the Examiner to withdraw the rejection of claims 2 and 3.

Claim 4

The Examiner has rejected claim 4 under 35 U.S.C. 103(a) as being unpatentable over Kume et al in view of Yamada et al as applied to claim 1, and further in view of Kuo (US 6,424,397 B1 - filed June 2, 2000 - issued July 23, 2002).

In response, the applicants call to the Examiner's attention that claim 4 now depends from claim 2. The applicants maintain that Kuo does not overcome the deficiencies of Kume et al and Yamada et al and further in view of Kishimoto with respect to claim 2. Consequently, the applicants maintain that claim 4 patentably distinguishes over the prior art. As a result, the applicants respectfully request the Examiner to withdraw the rejection of claim 4.

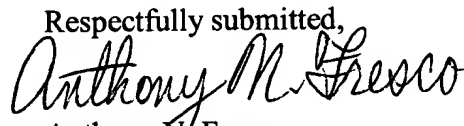
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Claims 5, 9-10 and 11-15

The Examiner has rejected claims 5 and 9-15 under 35 U.S.C. 103(a) as being unpatentable over Kume et al in view of Kuo (US 6,424,397 B1 - filed June 2, 2000 - issued July 23, 2002).

In response, the applicants call to the Examiner's attention that claims 5, 11-12 and 14-15 have been cancelled. The dependency of claim 13 has been changed from claim 1 to claim 2. The applicants maintain that Kuo does not overcome the deficiencies of Kume et al and Yamada et al and further in view of Kishimoto with respect to claim 2. Consequently, the applicants maintain that claim 13 patentably distinguishes over the prior art. As a result, the applicants respectfully request the Examiner to withdraw the rejection of claim 13.

The foregoing Amendment and Remarks establish the patentable nature of all of the claims remaining in the application, i.e., claims 2-4, 8-10 and 13. No new matter has been added. Wherefore, early and favorable reconsideration and issuance of a Notice of Allowance are respectfully requested.

Respectfully submitted,

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